

QUESTIONS AND ANSWERS

PLEASE REFER TO THE GENERAL FAQs SECTION OF ARPA-E'S WEBSITE (<http://arpa-e.energy.gov/?q=faq/general-questions>) FOR ANSWERS TO MANY GENERAL QUESTIONS ABOUT ARPA-E AND ARPA-E'S FUNDING OPPORTUNITY ANNOUNCEMENTS. ADDITIONAL QUESTIONS SPECIFIC TO THIS FOA ONLY ARE INCLUDED BELOW. PLEASE REVIEW ALL EXISTING GENERAL FAQs AND FOA-SPECIFIC QUESTIONS BEFORE SUBMITTING NEW QUESTIONS TO ARPA-E.

I. Concept Paper Phase Questions:

Q1. Will ARPA-E provide guidance on the plausibility of proposed personnel or team mix to assist the Applicant respond to the FOA?

ANSWER: ARPA-E will not pre-assess an applicant's proposal or teaming arrangement. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept and teaming arrangement warrants a submission.

Q2.1 On page 18 [in Section I.E], please clarify the below: it is not clear what are the criteria that need to be met.

Q2,1a Does the top group (53 kJ/L/h) on pp.15-16 apply only to the Carbon optimized fermentation strain engineering?

ANSWER: Yes.

Q2,1b For the same top group of p.18, does 40 g(C in product)/L refer to the mass of carbon only in the product or the total mass of the product?

ANSWER: The total mass of carbon in the product of interest. However, if outlined metrics constrain possibilities for proposed strategies to achieve the global metrics, alternate performance targets can be proposed and justified with a system-level TEA (refer to FOA Section I.E).

Q2.1c Does the 2nd group of criteria on page 18 apply only for Engineered systems or microbial consortia that utilize, recapture and/or recycle gaseous CO₂ into product?

ANSWER: Yes. ARPA-E seeks applications that combine various capacities for simultaneous organic and inorganic carbon utilization. This can be either through mixed microbial (consortia) systems, multiple bioreactor systems, or both.

Q2.2 What does mixotrophic mean? Applies only to consortia? In the literature, mixotrophic means simultaneous use of sugars and gases (whether by one organism or a consortium), which it looks like is the case for most if not all systems that would be relevant to this FOA

ANSWER: As set forth at FOA Section I.B: *Proposed systems of interest include, but are not limited to: ... (2) engineered mixotrophic consortia or systems that avoid CO₂ evolution ...* ARPA-E seeks applications that combine various capacities for simultaneous organic and inorganic carbon utilization. This can be either through mixed microbial (consortia) systems, multiple bioreactor systems, or both.

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Q3.1 Is the TEA required in the concept paper submission or only in the final application?

ANSWER: A very high-level technoeconomic analysis would be encouraged as part of the concept paper submission, recognizing that it may be based on limited experimental data. Information and data about proposed systems outlined in the Technical Performance Targets Table (refer to FOA Section IV.C.1.e) is required for the concept paper. ARPA-E is interested in commercial viability of the processes described in FOA submissions assuming technical success.

Q3.2 Can methanol be used as one of the encouraged feedstock in addition to serving as a reducing equivalent feedstock?

ANSWER: Methanol may be used as a carbon and/or reducing equivalent source alone or in conjunction with other feedstocks, so long as the process meets the technical performance targets outlined in the FOA and technoeconomic assumptions about methanol as a feedstock do not assume its origins from petroleum or any other fossil carbon source. All carbon feedstocks must be assumed to originate from renewable biomass or CO₂ for the purposes of system design and technoeconomic assessment.

Q3.3 Are we limited to the strains provided in the example strains for genetic engineering? Can we use *Escherichia coli* as our host?

ANSWER: Though *Escherichia coli* is allowed for genetic engineering, its limitations in scale up may not allow for high titers, high culture densities, or long term genetic stability needed for economic viability on the high-impact high-volume products required as part of this FOA. A sound high-level technoeconomic analysis must be provided to show that the process meets the technical performance targets outlined in the FOA.

Q4. In several places in the FOA, it is mentioned that desirable strains for engineering are any Agile BioFoundry strain or consortium, with Appendix 2 listing "Example strains for genetic engineering". Is this the complete list of strains that are viable/preferred or will others also be considered? Specifically I am interesting in whether *Escherichia coli* would be considered viable or preferred, and if so, if this is dependent on the type of molecule targeted (e.g. fuels or high-volume chemicals). Outside of the specific question related to *E. coli*, any additional guidance on the complete list of Agile BioFoundry strains, if strains other than those in Appendix II will be considered, would be appreciated as well.

ANSWER: The list is provided as an example. Though *Escherichia coli* is allowed for genetic engineering, its limitations in scale up may not allow for high titers, high culture densities, or long term genetic stability needed for economic viability on the high-impact high-volume products required as part of this FOA. A sound high-level technoeconomic analysis must be provided to show that the process could achieve the technical performance targets outlined in the FOA.

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Q5. In the FOA, methane is listed as an prohibited feedstock and a prohibited primary product. I want to confirm that methane is an acceptable intermediate. For example: an electrochemical process that uses CO₂ and renewable electricity to produce methane, and a biological process that converts methane into a fuel or chemical.

ANSWER: Methane is prohibited as a feedstock or product in Appendix 2 of Section I and Section III.C.3. It follows that methane would be an acceptable intermediate so long as the performers can show definitively that no methane remains in the final product.

Q6.1 The ECOSynBio DE-FOA-0002387 indicated that submissions must have primary products with a large potential for GHG reduction across the economy. Is a primary product like protein (fuel for animals and humans) with the GHG offset potential in the 100s of megatons per year in the right order of magnitude to be considered?

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q6.2 For technical category of interest "Engineered systems or microbial consortia that utilize, recapture and/or recycle gaseous CO₂ into product" can the multi-trophic co-culture start directly with CO₂ emissions as the feedstock?

ANSWER: CO₂ is a permitted feedstock for all categories. ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q7. We have the following question regarding Energy and Carbon Optimized Synthesis for the Bioeconomy (ECOSynBio) DE-FOA-0002387.

"Regarding the prohibited primary products described in Appendix 2, would non-gaseous C-1 products be acceptable if they pose a significant impact on GHG reduction?"

ANSWER: If a product could be identified such that it meets the Technical components specifically of interest (Appendix 2 of Section I), the submission will be considered responsive. ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

Q8. Dear members of the ARPA-E EcoSynio, for cell free systems, should we stress upon external reducing equivalents, electric grids and CO₂ utilization?

ANSWER: ARPA-E will not pre-assess an applicant's proposal or provide advice on how prepare the submission. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

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Q9. I have five questions regarding the topics for the FOA DE-EE-0002387 to best tailor our proposal for the topics.

First, for topic 'Engineered systems or microbial consortia that utilize, recapture and/or recycle gaseous CO₂ into product', could we propose to integrate the electrocatalytic system coupling with the microbial conversion?

Second, for the same topic, if we are seeking to use NH₃ as the electron donor, would the whole cell catalyst approach be responsive??

Third, for topic 'Delivery of both primary carbon oxides feedstocks and reducing equivalents in the gas phase (carbon utilization)'. If specially designed materials for gas delivery is proposed, would it be acceptable to couple with microbial engineering and fermentation optimization?

Fourth, do we need to specify a topic or two?

Fifth, Is it acceptable to address more than one topic in one proposal?

ANSWER: For questions 1 through 3: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission..

For questions 4 and 5: Applicants are not required to specify which to category they are addressing, so a proposal addressing more than one category of interest would be considered responsive.

Q10. I am a for-profit technical consultant that will be part of a team of universities and a national lab submitting for the EcoSynBio FOA. We anticipate only using at most 5% of the budget (<\$200,000).

According to the FOA:

- Project Teams composed exclusively of domestic educational institutions, domestic nonprofits, and/or FFRDCs/DOE Labs/Federal agencies and instrumentalities (other than DOE) are not required to provide cost share.
- Project Teams where domestic educational institutions, domestic nonprofits, small businesses, and/or FFRDCs perform greater than or equal to 80% of the total work under the funding agreement (as measured by the Total Project Cost) are required to provide at least 10% of the Total Project Cost as cost share. However, any entity (such as a large business) receiving patent rights under a class waiver, or other patent waiver, that is part of a Project Team receiving this reduction must continue to meet the statutory minimum cost share requirement (20%) for its portion of the Total Project Cost

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Does our team's inclusion of a for profit consultant trigger the need to include a 10% cost share requirement for the whole project? Notably the cost share requirement would now be greater than the cost of the consultant's services. Does this matter if we are listed as a consultant rather than a subcontractor?

ANSWER: ARPA-E may not provide pre-submission assessments on a project team's specific cost sharing requirement. Applicants should carefully review the cost sharing requirements for the specific FOA to which they intend to submit a Concept Paper or Full Application. General Questions regarding cost share may also be found under Frequently Asked Questions at: <https://arpa-e.energy.gov/faqs/general-questions>.

Q11. We would like to find out if our invention meets the requirements of this funding opportunity. Would ARPA-E review information from our website and provide comment on the eligibility of our invention under the FOA?

ANSWER: ARPA-E will not pre-assess an applicant's proposal. Prospective applicants must review the technical requirements of the FOA and independently determine whether their proposed concept warrants a submission.

II. Full Application Phase Questions:

Q12. We would like to inquire about the structure of the funding. Will there be a 2-phase approach with an intermediate go/no go milestone or will it have a different structure?

ANSWER: Refer to FOA Section II.A.